Change of States of Matter

Introduction to Change of States

Matter can exist in three states:

- Solid, Liquid, and Gas.

It can change its state when:

- Heated (gains energy).
- Cooled (loses energy).

Examples of State Changes:

- **Ice → Water → Vapour:** On heating, ice (solid) → melts into water (liquid) → evaporates into vapour (gas).
- **Vapour → Water → Ice:** On cooling, vapour (gas) → condenses into water (liquid) → freezes into ice (solid).

Processes of State Change

i. Melting (Fusion):

- The process by which a solid changes into a liquid.
- Occurs when heat is added.
- The temperature at which this happens is called the melting point.
- Melting Point of Ice: 0°C or 32°F.

Explanation:

When heated, the molecules gain energy, move faster, and spread apart.

Example: Ice melting into water.

ii. Evaporation (Vaporization):

- The process by which a liquid changes into a gas.
- Occurs when heat is added.
- The temperature at which this happens is called the boiling point.
- Boiling Point of Water: 100°C or 212°F.

Explanation:

When heated, liquid particles gain energy, move faster, and escape as gas.

Examples:

- Drying of clothes.
- Sweat evaporating from the skin.

iii. Condensation:

- The process by which a gas changes into a liquid.
- Occurs when heat is removed.

Explanation:

Gas particles lose energy, slow down, and form liquid droplets.

Examples:

- Water droplets forming on a cold drink can.
- Dew forming on leaves in the morning.

iv. Freezing (Solidification):

- The process by which a liquid changes into a solid.
- Occurs when heat is removed.
- The temperature at which this happens is called the freezing point.
- Freezing Point of Water: 0°C or 32°F.

Explanation:

Liquid particles lose energy and arrange into a fixed pattern.

Examples:

- Water freezing into ice.
- Molten wax solidifying when cooled.

v. Sublimation:

The process by which a solid directly changes into a gas without becoming a liquid.

Explanation:

Solid particles gain enough energy to become gas.

Examples:

- Camphor and dry ice subliming.
- Naphthalene balls slowly disappearing.

vi. Deposition:

The process by which a gas changes directly into a solid without becoming a liquid.

Explanation:

Gas particles lose energy quickly and form a solid.

Examples:

- Frost formation on leaves.
- Snowflakes forming in clouds.

Fun Facts About State Changes

i. Rocks Turn into Liquid (Magma):

- When rocks are heated at extremely high temperatures, they turn into magma or lava.

ii. Gas Can Become Liquid Under Pressure:

- Natural gas is shipped in liquid form (LNG) to save space.
- When pressure is applied, the gas molecules are squeezed together into liquid form.

iii. Mercury – The Liquid Metal:

- Mercury is a metal that exists in liquid form at room temperature.
- It is used in thermometers and barometers.

iv. Water Expands When It Freezes:

- Unlike most substances, water expands when it freezes.
- This is why ice floats on water.

v. Plasma – The Fourth State of Matter:

- Plasma is a state where atoms are ionized (lose electrons).
- **Found in:** Stars, lightning, and neon lights.

Key Takeaways

State Changes of Matter:

- **Melting:** Solid → Liquid (by heating).
- **Evaporation:** Liquid → Gas (by heating).
- **Condensation:** Gas → Liquid (by cooling).
- **Freezing:** Liquid → Solid (by cooling).
- **Sublimation:** Solid → Gas (direct change, by heating).
- **Deposition:** Gas → Solid (direct change, by cooling).

Temperature Points:

- **Melting Point of Ice:** 0°C.
- **Boiling Point of Water:** 100°C.
- **Freezing Point of Water:** 0°C.

Interesting Facts:

- **Gas** → Liquid under pressure.
- Mercury is a liquid metal at room temperature.
- Water exists naturally in all three states.